Assessment of clinical diagnostic accuracy compared with pathological diagnosis of basal cell carcinoma

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ABSTRACT

Background: Basal cell carcinoma (BCC) is the most common type of skin cancer, afflicting light skin more than dark skin people. This malignancy metastasizes rarely and has unique histological properties. **Aims and Objectives:** We focused on the accuracy of clinical diagnoses of BCC by specialists. **Materials and Methods:** Patients' information for 4-year period between 2007 and 2011 was extracted from files at a Pathology Department. The results were analyzed using the Chi-square method and SPSS software. **Results:** From 367 referred cases dermatologists diagnosed 41% as direct BCC cases, 43.4% through excluding other skin diseases, 4% incorrectly and 1.11% unidentified. For other specialists (including plastic surgeons, ophthalmologists, general surgeons, and general practitioners) these were respectively 47.8%, 22.4%, 6.3% and 23.5%. Dermatologists had diagnosed 107 cases of all skin diseases as BCC through clinical examination of which 78.5% were correctly and 21.5% incorrectly diagnosed. The same parameters for all other specialists were respectively 77.36% and 22.64%. Diagnostic sensitivity, positive reportability, clinical conjecture indicator (CCI) and clinical diagnostic indicator were respectively 84.4%, 78.5%, 121.5% and 75.6%; whereas for other specialists these indicators were 70 among cases diagnosed by dermatologists as BCC, where pathological results showed other causes. The most common diagnosis by pathologists and other specialists was reported as squamous cell carcinoma (SCC). Among cases not diagnosed by dermatologists as BCC, where pathological results indicated BCC, the most common clinical diagnosis was malignant melanoma by dermatologists and SCC by other specialists. **Conclusion:** Dermatologists diagnosed BCC with higher sensitivity and positive reportability; also, CCIs and clinical diagnostic correctness was higher among dermatologists. The necessity for consulting with dermatologists and referring all skin diseases samplings to pathologist is thus clearly visible.

Key words: Basal cell carcinoma, clinical diagnosis, pathological diagnosis

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INTRODUCTION

Basal cell carcinoma (BCC) is a malignant type of skin tumor in which the cells resemble basal epidermal cells, and they are believed to originate from hair follicles. BCC is observed most commonly in the head and neck areas, but may afflict any part of the skin. The most frequent symptom is a bleeding wound that heals but recurs periodically.[1] BCC is the most common skin cancer among people with fair skin, where >99% of patients are fair skinned.[2,3] Although the spread of BCC increases with exposure of a population to sunlight, distribution of the disease shows no direct relationship with the level of exposure to ultraviolet radiation.[4]

Basal cell carcinoma is more common among men, and the annual number of BCC diagnoses in the United States for men and women is respectively 175 and 124/100,000; in Australia, the numbers are respectively 849 and 605/100,000.[4] Sunlight has a significant effect on the development of this type of tumor, and most such tumors are observed in areas with moderate levels of sunlight;[5] however, some sources point out that sudden and intense exposure to sunlight is also effective in this regard.[4]

Although BCC can occur at any age, it has the highest frequently among patients over 40 years old.[4] The primary diagnostic method is clinical examination, and pathological evaluation is confirmatory. Therefore, having proper clinical

conjecture will lead to early diagnosis, more suitable treatment, and fewer cases of disability or death. Advanced cases require more complicated and more expensive treatment methods. The spread of this malignancy has been on the rise in the past years. Whereas 726/100,000 of the Australian population seek treatment for this type of cancer every year,[5] in Iran, a 4.9% increase in BCC cases has been observed;[6] therefore, the need for prompt clinical diagnosis (CD) is apparent. This study focuses on the accuracy of clinical diagnoses of BCC by various specialists.

MATERIALS AND METHODS

After approving the study protocol by the university medical Ethics Committee, records of all cases of skin diseases kept at the Pathology Department of our hospital during 2007–2011 were reviewed. Information on patients was divided into four categories: (1) CD of BCC; (2) BCC is present in differential diagnosis; (3) BCC is not present in differential diagnosis; and (4) No CD. The validity of CD was compared with the final pathological result, and diagnostic validity was also compared between dermatologists and other specialists (including plastic surgeons, ophthalmologists, general surgeons and general practitioners) in these four groups. Data for each patient was entered in the designed questionnaire and was then analyzed using the SPSS software (SPSS Inc., Chicago, IL). After calculation of sensitivity and positive reportability for dermatologists and nondermatologists, data was analyzed using the Lightstone's formula[7] in order to arrive at the accuracy levels of CD and clinical conjecture.

RESULTS

Four hundred and forty-seven cases of CD related to the objectives of this study were collected, out of which 367 cases were diagnosed through pathological inspection as BCC skin cancer, and two cases were dismissed due to unclear pathological findings.

Figures 1 and 2 show the frequency and proportional frequency of BCC according to the year of sampling and age of the patients, respectively. Of 367 instances of BCC diagnosis,
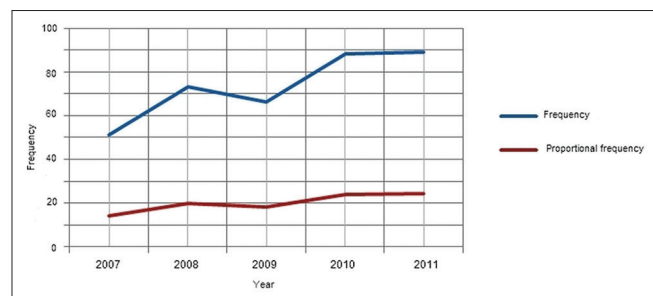
217 cases (59.1%) were men and 150 (40.9%) were women. Analysis of the results showed 99 cases of BCC had been referred to dermatologists, out of which dermatologists had diagnosed 41 cases (41.1%) directly and 43 cases (43.4%) through exclusion from other clinical diagnoses. Four cases were diagnosed incorrectly and 11 cases were left undiagnosed. Upon further analysis, 268 cases of BCC were referred to other specialists, of whom 128 cases (47.8%) were diagnosed directly and 60 cases (22.4%) through exclusion from other clinical diagnoses. Seventeen cases (6.3%) were diagnosed incorrectly and 63 cases (23.5%) were left undiagnosed.

Of the 367 BCC cases sampled, 169 (46%) were diagnosed directly and 103 (28.1%) through exclusion from other clinical diagnoses. Twenty-one cases (5.7%) were diagnosed incorrectly and 74 instances (20.2%) were left without a diagnosis. The diagnostic differential between dermatologists and other specialists was significant (P = 0.0004) [Figure 3].

Within their CD, dermatologists identified 107 instances of BCC (directly or indirectly), out of which 84 cases (78.5%) were diagnosed correctly and 23 instances (21.5%) incorrectly. Other specialists had diagnosed 243 cases as BCC (directly or indirectly), of which 188 cases (77.36%) were diagnosed correctly and 55 (22.64%) incorrectly. All specialists had diagnosed 350 cases as BCC (either directly or indirectly), from which 272 cases (77.71%) were diagnosed correctly and 78 (22.29%) incorrectly. The diagnostic accuracy differential between dermatologists and other specialists was insignificant (P = 0.056) [Figure 4].

Based on our analyses, diagnostic accuracy and clinical conjecture indicator (CCI) were 75.6% and 121.5% respectively for dermatologists, and 72.3% and 118.5% respectively for other specialists; whereas in total, the numbers were 73.3% and 119.4% respectively.

The most common areas of BCC were on the nose, scalp and cheeks; trunk was the least common affected area.
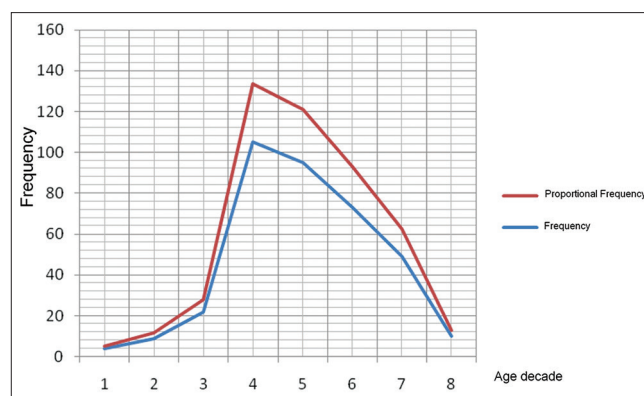

Figure 1: Basal cell carcinoma according to the year of sampling

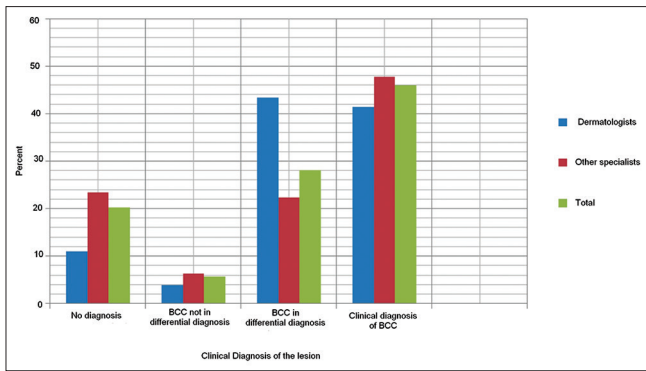**Figure 2:** Basal cell carcinoma according to the age of patients

Figure 3: Diagnostic differential between dermatologists and other specialists based on clinical diagnosis

The frequency of people referring for BCC during 2010 and 2011 showed a sharp increase when compared to the three previous years. The highest frequency of BCC cases were in the age ranges of 50–59, 60–69 and 70–79 respectively and the lowest frequency was observed in the age range of 20–29. About 60% of the patients were men and the rest women.

Dermatologists diagnosed 84% of BCC cases directly or by exclusion, and this number was 70.2% for other specialists. Dermatologists diagnosed 4% of BCC cases incorrectly, and this number was 6.3% for other specialists. Dermatologists left 11% of BCC cases without diagnosis, and this number was 23.5% for other specialists. In total, all physicians had diagnosed 74.1% of the cases as BCC either directly or through exclusion, 5.7% incorrectly, and 20.2% were left without diagnosis.

Among cases where the CD of dermatologists has been BCC (directly or by conjecture), 78.5% was correctly diagnosed, and in 21.5% of the cases the diagnoses have incorrectly pointed to other diseases. These numbers for other specialists were respectively 77.36% and 22.64%; and in total for all physicians were respectively 77.71% and 22.29%.

Within cases where dermatologists had clinically diagnosed BCC but pathological examinations have indicated other diseases, the most common pathological results have been as 21.7% squamous cell carcinoma (SCC), 21.7% seborrhic keratosis (SK), 13.04% actinic keratosis and 8.6% lichenoid reaction. Results for other specialists were respectively 36% SCC, 14.5% SK and 9.09% verrucous carcinoma.

Among cases where the CD of dermatologists has not been BCC but pathological diagnosis have indicated BCC, the most common incorrect CD have been: BCC (four cases), malignant melanoma (MM – two cases), and the rest were variously diagnosed. The results for other specialists were respectively 52% SCC, 17.6% nevus and 11.7% MM.
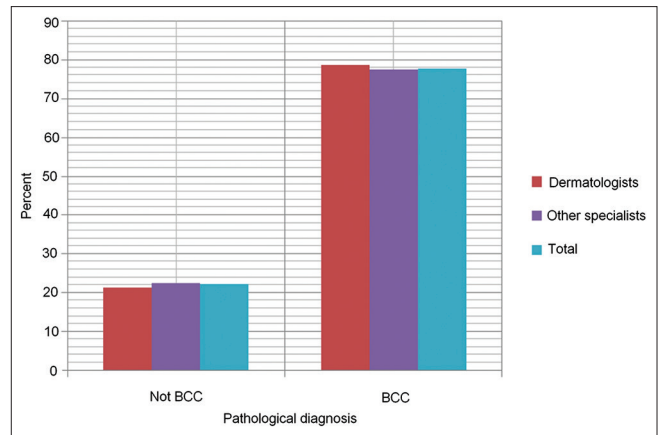

Figure 4: Diagnostic differential between dermatologists and other specialists based on pathological diagnosis

DISCUSSION

Basal cell carcinoma is made of basal epidermic cells and can afflict all skin areas. In the study conducted by Zadeh in Ahwaz (Iran), the most common sites of the disease have been respectively nose, cheek, chin and scalp;[8] another study by Kavoussi *et al*. in Kermanshah (Iran) has pointed respectively to the nose, cheek and scalp.[9] The results of the present study showed the most common areas to be respectively the nose, scalp and cheeks, which is similar to the previous studies. It seems that BCC, similar to most other malignancies affecting men and women, is observed most commonly among men. In the study by Zadeh *et al*., men had been afflicted by the disease 1.1 times more than women,[8] and in the study by Kavoussi *et al*. men were afflicted 1.35 times more than women. Similar to previous studies, the present study showed a male:female ratio of 1.4:1. The higher frequency of BCC among men is possibly due to the occupational conditions of men working outdoors, with lesser clothing coverage as compared to women.

In general, decreased immunity with age, cumulative effect of environmental and dietary carcinogens, as well as improved detection influence the incidence of various types of cancer. Accordingly, the study conducted by Zadeh reports the most frequent age of cancer patients to be between 60 and 69 years old.[8] However, findings of the present study indicate an age range of 50–59 years. The lower age range of patients in Yazd is probably due to climatic conditions, exposure to sunlight from childhood and lifestyles of people in this province. A Dutch study on the affliction and frequency of BCC has also pointed to an increased incidence of BCC in the studied time frame.[10] The present study also showed a significant rise in BCC cases over the last two years of the study period, which is deemed to be due to changes in lifestyle, higher exposure to carcinogens, and more effective filtering and diagnostic systems. It is observed

that radiotherapy, used over 40–50 years ago in the region as a cure for fungal infections of the scalp could also have contributed to the increased occurrence of BCC.

In the study by Ek *et al*., the sensitivity and clinical positive reportability for plastic surgeons was reported respectively as 89% and 64.5%,[11] and in the study by Youl *et al*., as 89% and 68%, for dermatologists and 79% and 58% for general practitioners.[12] In the study by Heal *et al*., the sensitivity and clinical positive reportability for specialists has been reported as 63.9% and 72.7%, respectively.[13] In the present study, the sensitivity and clinical positive reportability is respectively 84.4% and 78.5% for dermatologists, and 70.1% and 77.3% for other physicians. Dermatologists and plastic surgeons diagnose cases of BCC more accurately, when compared to other specialists; therefore it is necessary that nondermatologist colleagues reduce inaccurate diagnoses through specialized training and more attention. They may also make more appropriate decisions by consulting dermatologists.

A historical study was conducted by Matteucci *et al*. in 2011[14] with the objective of examining the relevance and importance of the accuracy of clinical diagnoses, and its important role in better treatment of skin malignancies. In all, 1186 lesions were removed; 25% of the cancers were intrusive. Clinical diagnoses were correct in 700 (66%) of the cases, of which 89% were BCC and 33% SCC as proven by histopathology of the lesions. Incorrect diagnosis of SCC and BCC as benign conditions also resulted in a significant delay in treatment. For the malignancy diagnoses, there was 91% sensitivity, 84% specificity, 65% positive reportability and 96% negative reportability.[14] Of the cases where the clinical diagnoses of dermatologists were BCC (directly or by conjecture), 78.5% were correctly diagnosed and 21.5% incorrectly; these figures for other specialists were respectively 77.36% and 22.64%. The differences were not significant (P = 0.056) and there were no similar studies to examine and compare the relative frequency distribution of pathological results of the cases of BCC diagnosis.

The number of cases of no CD by nonspecialists has been more than twice as that by dermatologists (23.5% compared with 11%); therefore, the need for consulting a dermatologist before surgery or taking a sample seems quite clearly present. All physicians should document their CD, in order to assist pathologists in their work. The reasons for nondocumentation of CD may include a lack of a correct diagnosis, being too busy, filling of pathological forms by assistants or nurses and lack of attention of physicians to the contents of these forms.

Clinical conjecture indicators and clinical diagnostic accuracy was developed through the Lightstone series of studies into the analysis of clinical awareness of BCC, and in those studies was respectively reported as 103% and 76%;[7] a study by Presser and Taylor measured the same numbers between three groups of dermatology residents, dermatology faculty members

and private dermatologists,[15] in which the percentages for CCIs were respectively 139%, 133% and 130% and clinical diagnostic accuracy percentages were respectively 64%, 65% and 70%. Another study conducted in Kerman into the diagnostic capability of ophthalmologists of eyelid BCC showed CCIs and clinical diagnostic accuracy of respectively 78.8% and 72.7%.[16] The present study shows a CCI and clinical diagnostic accuracy of respectively 121.5% and 75.6% for dermatologists and 118.5% and 73.3% for other specialists, and 119.4% and 72.3% for all physicians. CCIs and clinical diagnostic accuracy was higher among dermatologists than other specialists, but similar to other studies with regard to all physicians. It is worth nothing that other specialists left a considerable number of cases of BCC without diagnosis, which were left out of the Lightstone's formula for the measurement of clinical conjecture and clinical analysis, otherwise the difference between clinical indicators and CD would have been much greater.

Amongst cases where dermatologists had diagnosed BCC but pathological examinations indicated other causes, Presser and Taylor showed the following results; residents: Actinic keratosis 37%, SCC 16% and elastosis 14%; dermatology faculty members: Actinic keratosis 37% and various other diagnoses with small percentages; private dermatologists: Actinic keratosis 32%, SCC 16% and nevi 11%.[15] In the present study the most common pathological results are as follows: SCC 21.7%, SK 21.7%, actinic keratosis 13.04% and lichenoid reaction 8.6%; whereas other specialists' diagnoses showed SCC 36%, SK 14.5% and verrucous carcinoma 9.09%. These results point to the fact that diagnostic accuracy of dermatologists with regard to other skin malignancies is higher than other specialists and surgeons. Other specialists did not correctly diagnose (around 45%) other skin malignancies (SCC and verrucous carcinoma). Therefore, the necessity of consultation with dermatologists for proper treatment of skin diseases, especially when malignancies are suspected becomes more clearly evident.

According to a study by Reek *et al*., amongst cases where CD was not BCC but pathology showed BCC, fewer dermatologists had diagnosed the malignancy as a benign case than other specialists.[17] In Presser and Taylor study, the most common clinical diagnoses are reported as actinic keratosis 20% for residents, SCC 20% for private dermatologists and only one case of SCC for dermatology faculty members.[15] In the present study, the most common incorrect clinical diagnoses by dermatologists were as follows: MM 25%, SK 12.5%, lichenification reaction 12.5% and discoid lupus erythematosus 12.5%; whereas for other specialists these numbers are SCC 52%, nevus 17.65% and MM 11.7%. While dermatologists made fewer incorrect diagnoses of BCC as benign conditions when compared to other specialists, it is vital that all samples taken during surgery be sent to pathological laboratories. A percentage of physicians' diagnoses had been benign but pathological results showed malignancy such as SCC or BCC. If

samples were not sent to pathological laboratories, these cases would never reach a correct diagnosis, resulting in serious consequences for patients and their treatment.

It is therefore strongly recommended that all samples be sent to pathological laboratories in order to prevent nondiagnosis and incorrect diagnosis. Furthermore, it is recommended that dermatologists be routinely consulted prior to skin surgery by specialists for a more accurate and timely diagnosis.

REFERENCES

1. Askari SK, Schram SE, Wenner RA, Bowers S, Liu A, Bangerter AK, *et al.* Evaluation of prospectively collected presenting signs/symptoms of biopsy-proven melanoma, basal cell carcinoma, squamous cell carcinoma, and seborrheic keratosis in an elderly male population. J Am Acad Dermatol 2007;56:739-47.
2. Marks R, Staples M, Giles GG. Trends in non-melanocytic skin cancer treated in Australia: The second national survey. Int J Cancer 1993;53:585-90.
3. Miller SJ. Biology of basal cell carcinoma (Part II). J Am Acad Dermatol 1991;24:161-75.
4. Quinn A.G, Perkins W. Non-melanoma skin cancer and other epidermal skin tumors in: Burns T, Breathnach S, Cox N, Griffiths C. editors. Rook's Textbook of Dermatology. 8th ed. 2010. p. 52.1-3
5. Marks R. The epidemiology of non-melanoma skin cancer: Who, why and what can we do about it. J Dermatol 1995;22:853-7.
6. Barzegari M, Ehsani AH, Naraghi SZ, Akhyani M, Roubati RM, Bagherinezhad S. Comparison of relative frequency of basal cell carcinoma in 1368-69 and 1378-79, in Razi hospital, Tehran. Iran J Dermatol 2006;9;159-64.
7. Lightstone AC, Kopf AW, Garfinkel L. Diagnostic accuracy – A new approach to its evaluation; results in basal cell epitheliomas. Arch Dermatol 1965;91:497-502.
8. Zadeh ND. Retrospective study of the non-melanocytic skin cancers in imam Khomeini Hospital of Ahwaz 1994-98. Iran J Dermatol 2000;3:16-22.
9. Kavoussi H, Rezaei M, Isapour D, Doulabi SS. Clinical types and characteristics of basal cell carcinoma in Kermanshah province in 2009. JDC 2012;3:100-9.
10. Flohil SC, de Vries E, Neumann HA, Coebergh JW, Nijsten T. Incidence, prevalence and future trends of primary basal cell carcinoma in the Netherlands. Acta Derm Venereol 2011;91:24-30.
11. Ek EW, Giorlando F, Su SY, Dieu T. Clinical diagnosis of skin tumours: How good are we? ANZ J Surg 2005;75:415-20.
12. Youl PH, Baade PD, Janda M, Del Mar CB, Whiteman DC, Aitken JF. Diagnosing skin cancer in primary care: How do mainstream general practitioners compare with primary care skin cancer clinic doctors? Med J Aust 2007;187:215-20.
13. Heal CF, Raasch BA, Buettner PG, Weedon D. Accuracy of clinical diagnosis of skin lesions. Br J Dermatol 2008;159:661-8.
14. Matteucci P, Pinder R, Magdum A, Stanley P. Accuracy in skin lesion diagnosis and the exclusion of malignancy. J Plast Reconstr Aesthet Surg 2011;64:1460-5.
15. Presser SE, Taylor JR. Clinical diagnostic accuracy of basal cell carcinoma. J Am Acad Dermatol 1987;16:988-90.
16. Meshkat M, Saryazdi S. Clinical diagnostic accuracy of basal cell carcinoma of the periorbital region. J Mazandaran Univ Med Sci 2005;15:62-6.
17. Reeck MC, Chuang TY, Eads TJ, Faust HB, Farmer ER, Hood AF. The diagnostic yield in submitting nevi for histologic examination. J Am Acad Dermatol 1999;40:567-71.